

***Weeds & invasive plant species:  
From identification to management  
decisions***

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# Outline

1. Plant anatomy and classification
2. Information needed to diagnose a weed problem and to design a management strategy
3. Population dynamics and weed control based on disturbance frequency

# Weed ID steps

1. Collect a proper sample
2. Document the context in which the “weed” is found
3. Contact the right person (don’t guess!)
4. Learn the taxonomic traits that are distinctive
5. Use reference texts and/or websites for future cases











Do not memorize the shape of your sample. Plant ID is not about the “whole” plant but the distinctive taxonomic traits instead.





# Photo(s) for Sample ID

## Dicots and Monocots

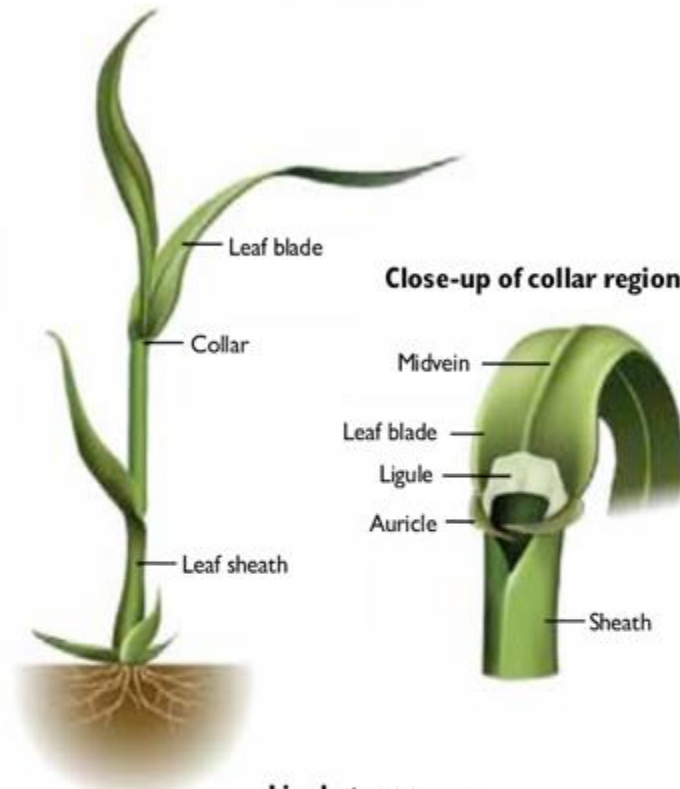
- Include a size reference
- Overall plant structure
- Leaf shape
- Leaf arrangement
- Inflorescence

## Monocots

- Sheath
- Collar
- Ligule
- Tillers
- Rhizomes and stolons

# Monocots

Basic structure of grass shoot

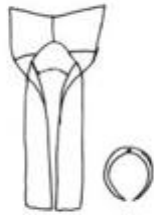


Ligule types

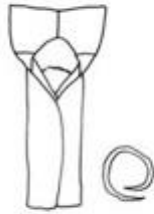


# Monocots

## Sheaths



Split



Split, margins overlapping



Closed

## Ligule Types



Membranous



Fringe of hairs



Absent

## Auricles



Claw-like



Rounded



Rudimentary



Absent

## Ligule Shapes



Acute



Obtuse



Truncate



Emarginate

## Collars



Broad



Narrow



Divided



Oblique



Pubescent

## Ligule Margins



Entire



Notched



Lacerate



Ciliate

# Monocots

## Examples of seedheads



**Panicle:** Triangular in outline with seeding branches around the main stem. Examples: Bluegrass, Redtop.



**Spike:** Spikelets attached at the top of an unbranched stem. Examples: Timothy, Foxtail



Slender seeding spikes attached at the top of the main stem. Examples: Crabgrass, Goosegrass



Slender seeding spikes attached along the top of the main stem. Examples: Signalgrass, Dallisgrass

## Examples of spikelets



Forming clusters of seeds. Examples: Bluegrass, Ryegrass



With long pointed awns. Examples: Nimblewill, Wild Oats

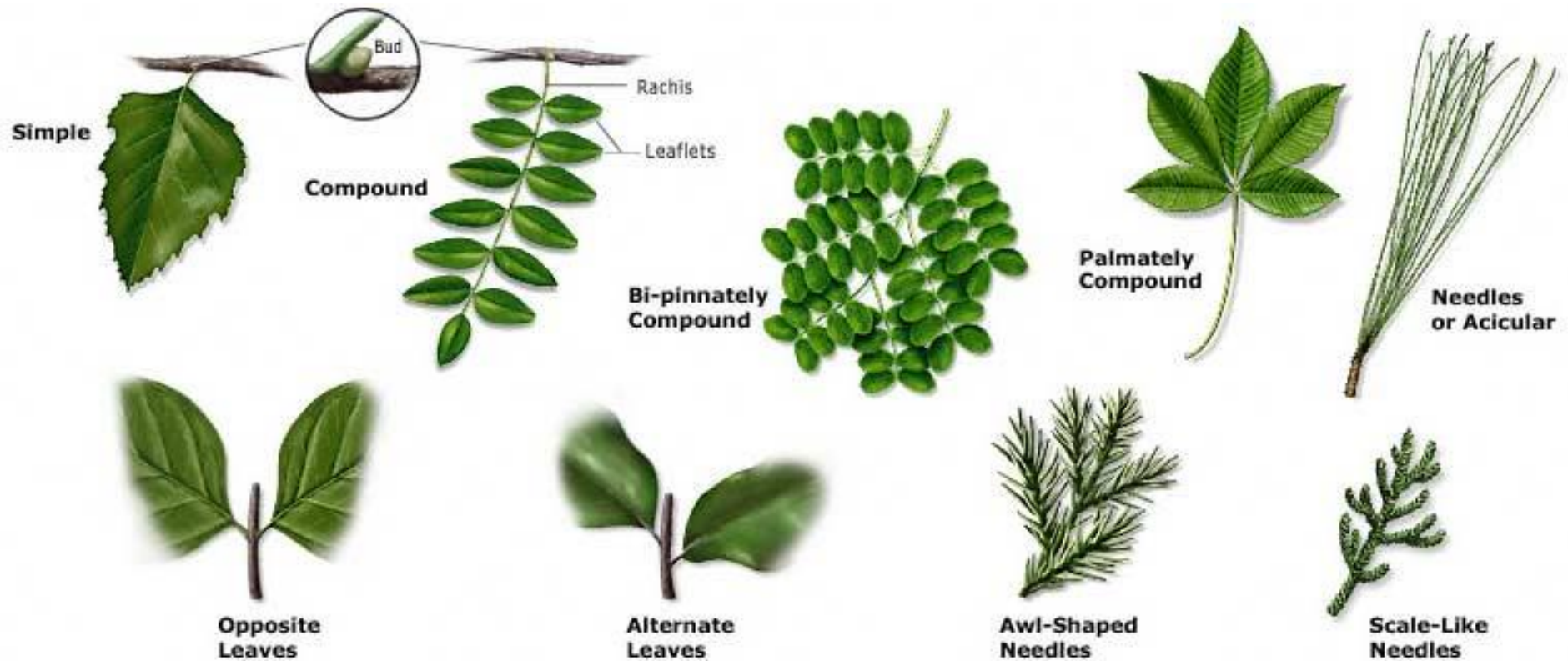


Born singly on short branches. Examples: Witchgrass, Fall Panicum



Containing several seeds. Examples: Sandbur, Buffalograss

# Dicots



# Dicots

## Leaf Shapes



Lanceolate



Ovate



Obovate



Star-shaped

## Leaf Forms



Linear or Rectangular



Heart-shaped or Orbicular



Oval



Elliptical



Deltoid

## Leaf Apexes



Acuminate



Acute



Obtuse



Truncate



Bristle Pointed



Rounded

## Leaf Margins



Entire



Dentate



Toothed or Serrate



Sinuate or Wavy



Doubly Serrate



Lobed



Incised

## Leaf Bases



Wedge-shaped or Cuneate



Inequilateral



Rounded



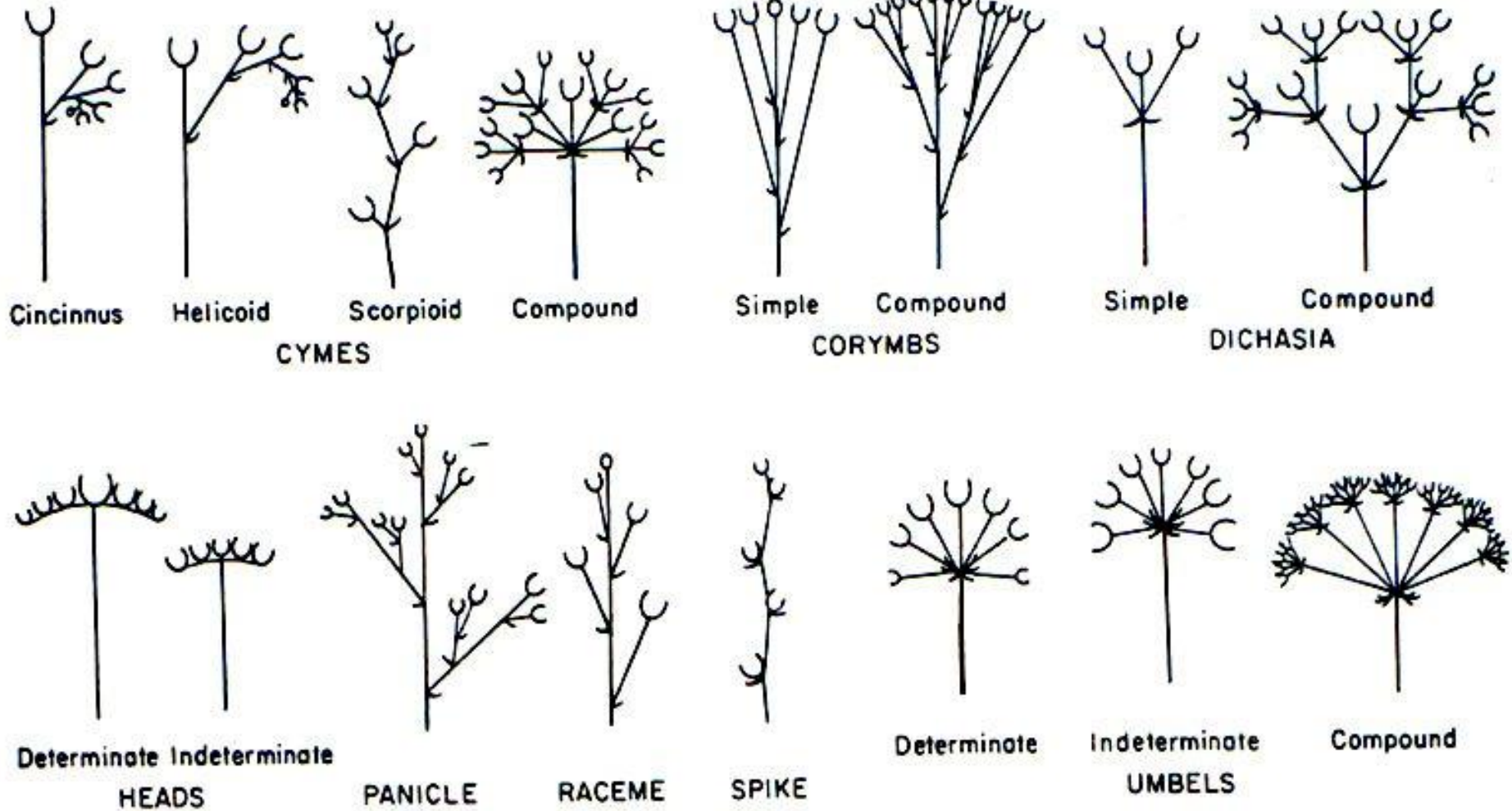
Heart-shaped or Cordate



Truncate

# Dicots

## INFLORESCENCE TYPES



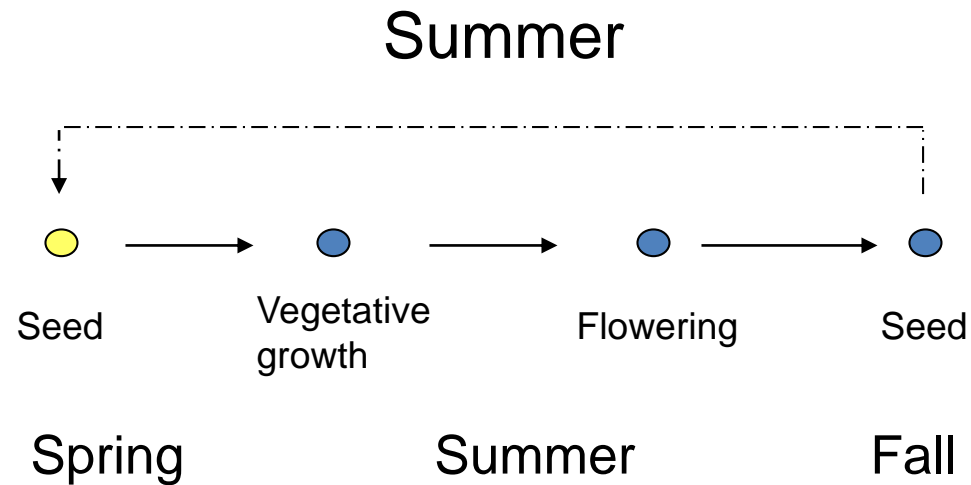
# Life Cycles

- Annual
  - Summer
  - Winter
- Biennial
- Perennial

*Life cycle of a species may vary with environment*

# Annuals

- Complete cycle in single season
- Dominant weeds of annual crops



# Life Cycles

- Annual
  - Summer

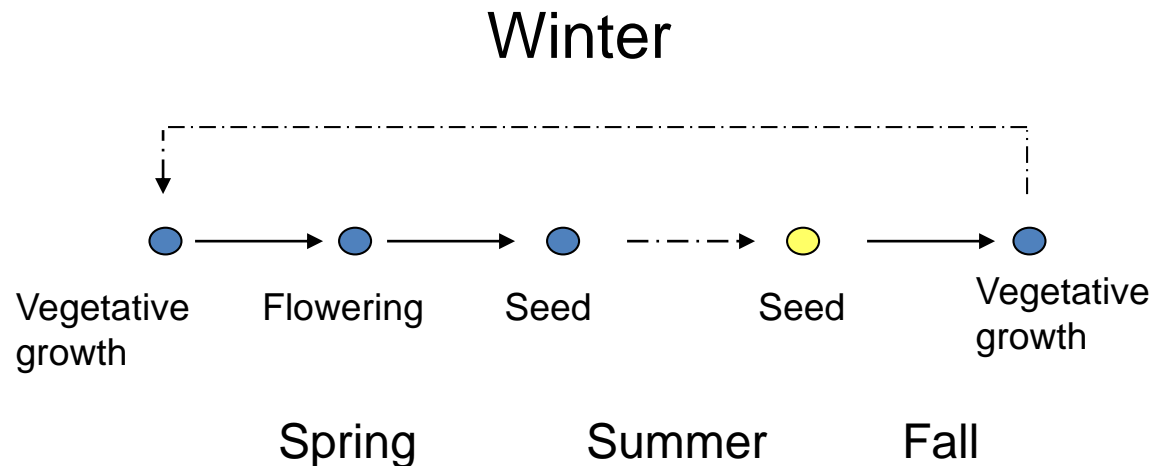


Spiny amaranth



Sicklepod

# Winter Annuals



- Problems in small grains, forages, no-till
- Many winter annuals also can act as summer annuals
  - 5-30% of horseweed emerged in spring (Buhler, 1997)

# Life Cycles

- Annual
  - Winter

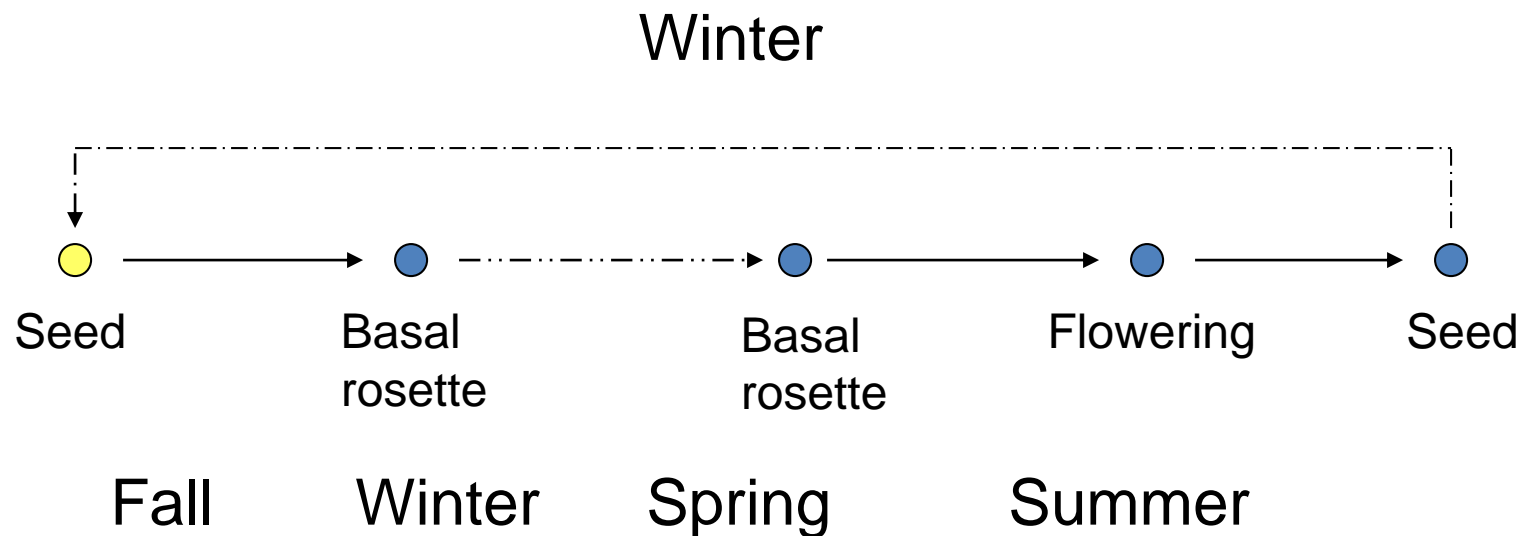
*Sonchus oleraceus*

Annual sowthistle



# Biennials

- Found in pastures, roadsides, etc.
- Seed production cause of plant death



# Life Cycles

- Biennial

## Thistles

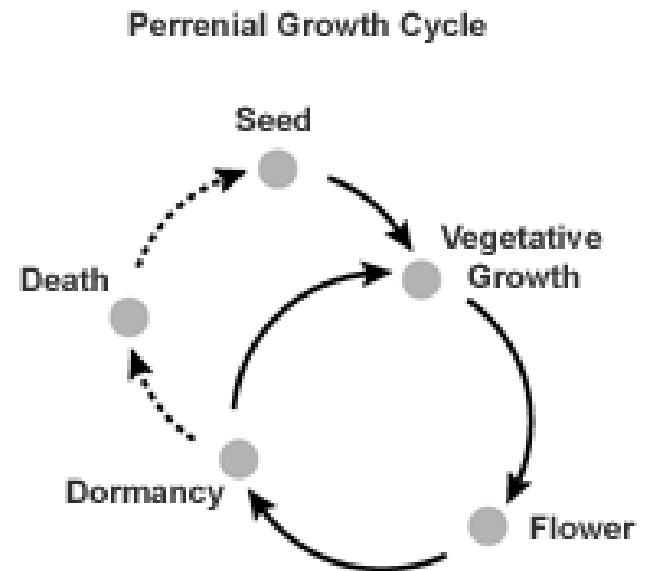


# Wild Radish



# Perennials

- Capable of surviving for more than two years
- Most weedy perennials can reproduce both by seed and vegetative structures

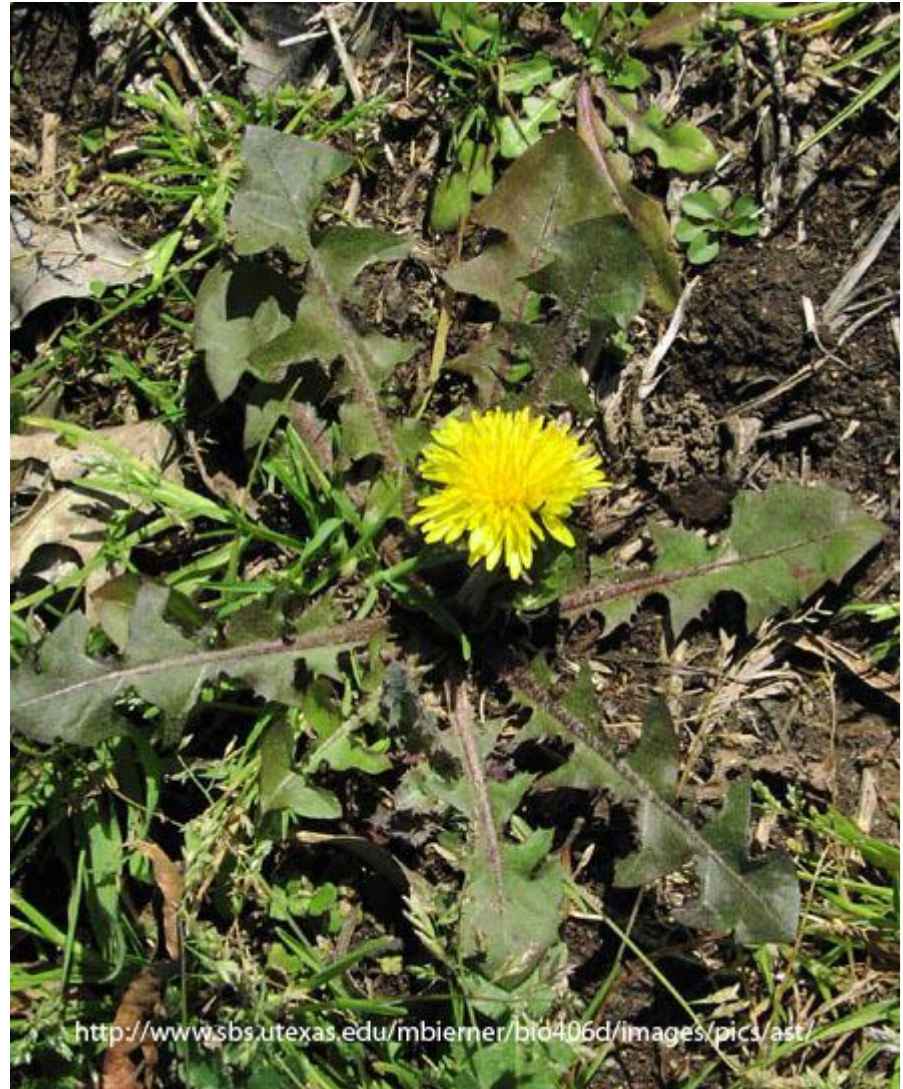


# Life Cycles

- Simple Perennial  
(Propagated by seed)

*Taraxacum officinale*

Dandelion



<http://www.sbs.utexas.edu/mbierner/bio406d/images/pics/ast/>

# Carolina horsenettle



# Blackberry / Dewberry



# Smutgrass



# Life Cycles

- Creeping Perennial  
(Propagated by seeds,  
stolons, tubers and  
rhizomes)

*Sorghum halepense*

Johnsongrass



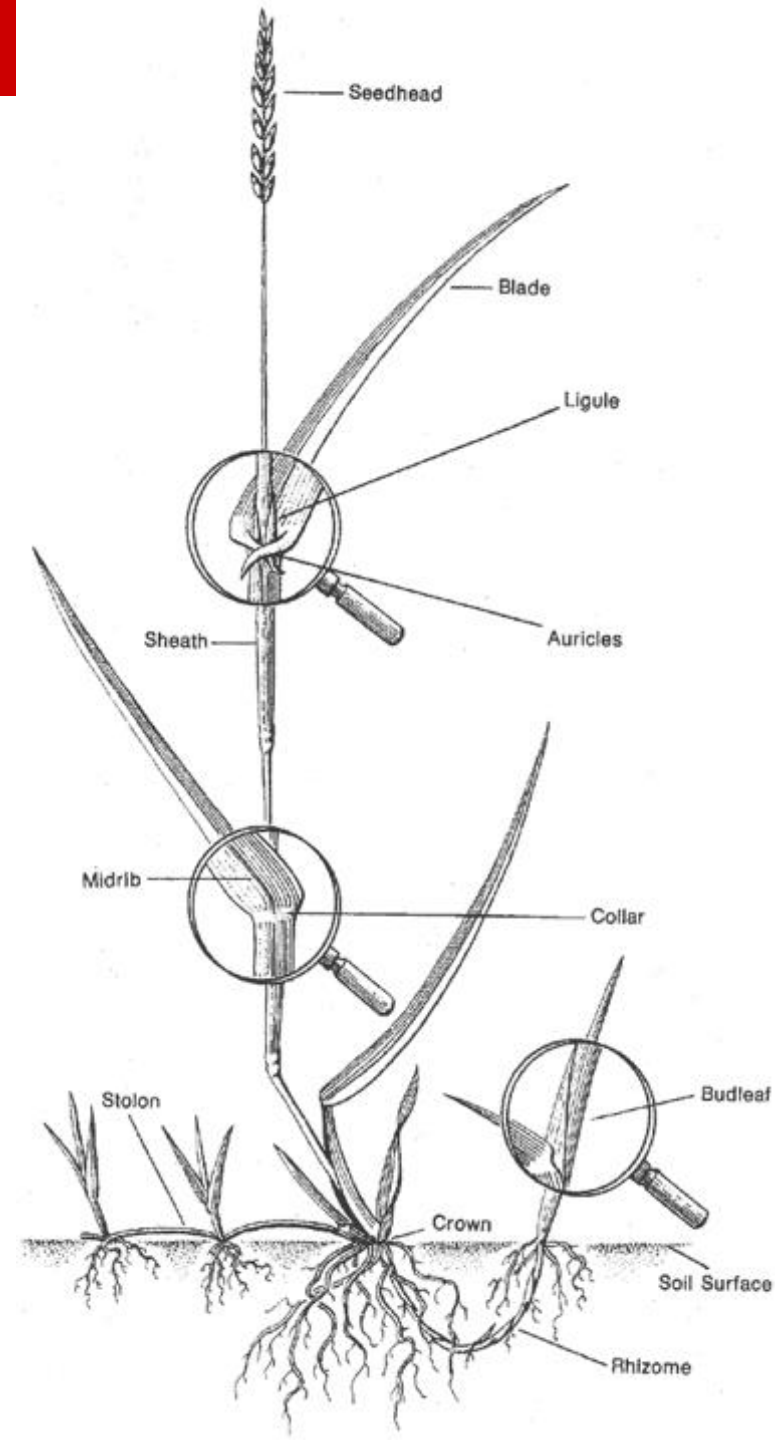
<http://www.naturesongs.com/vvplants/johnsongrass1>

# Life Cycles

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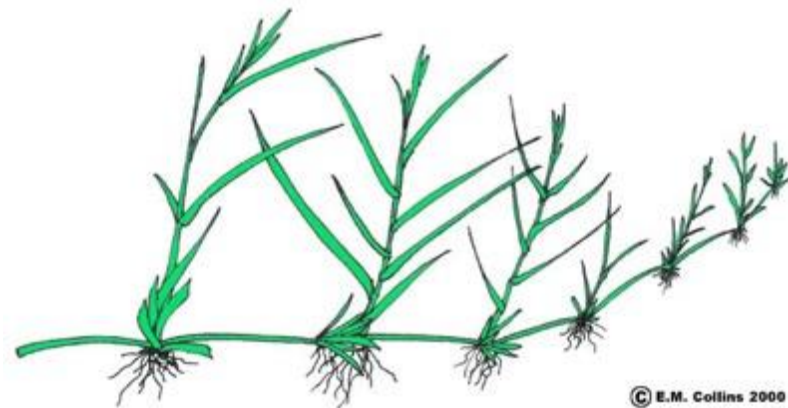


[http://www.nwcb.wa.gov/weed\\_info/plant\\_images/](http://www.nwcb.wa.gov/weed_info/plant_images/)



# Vegetative Stem Structures

- Rhizomes (quackgrass, johnsongrass)
- Stolon (bermudagrass)
- Tubers (yellow and purple nutsedge)
- Bulbs (wild garlic)



# Vegetative Rootstocks

- Lack nodes and buds
- Canada thistle, dandelion



# Vegetative Reproduction

- Fewer propagules per plant
  - Populations more stable
  - Spread less quickly
- Better adapted to areas of low disturbance
  - Annual weeds in annual crops
  - Perennial weeds in perennial crops
  - Invasive species in natural systems

# Weed definitions by plant scientists

- *“A plant out of place or growing where it is not wanted”* Blatchley (1912)
- *“A plant that is growing where it is desired that something else shall grow”* Georgia (1916)
- *“A plant growing where we do not want it”* Salisbury (1961)

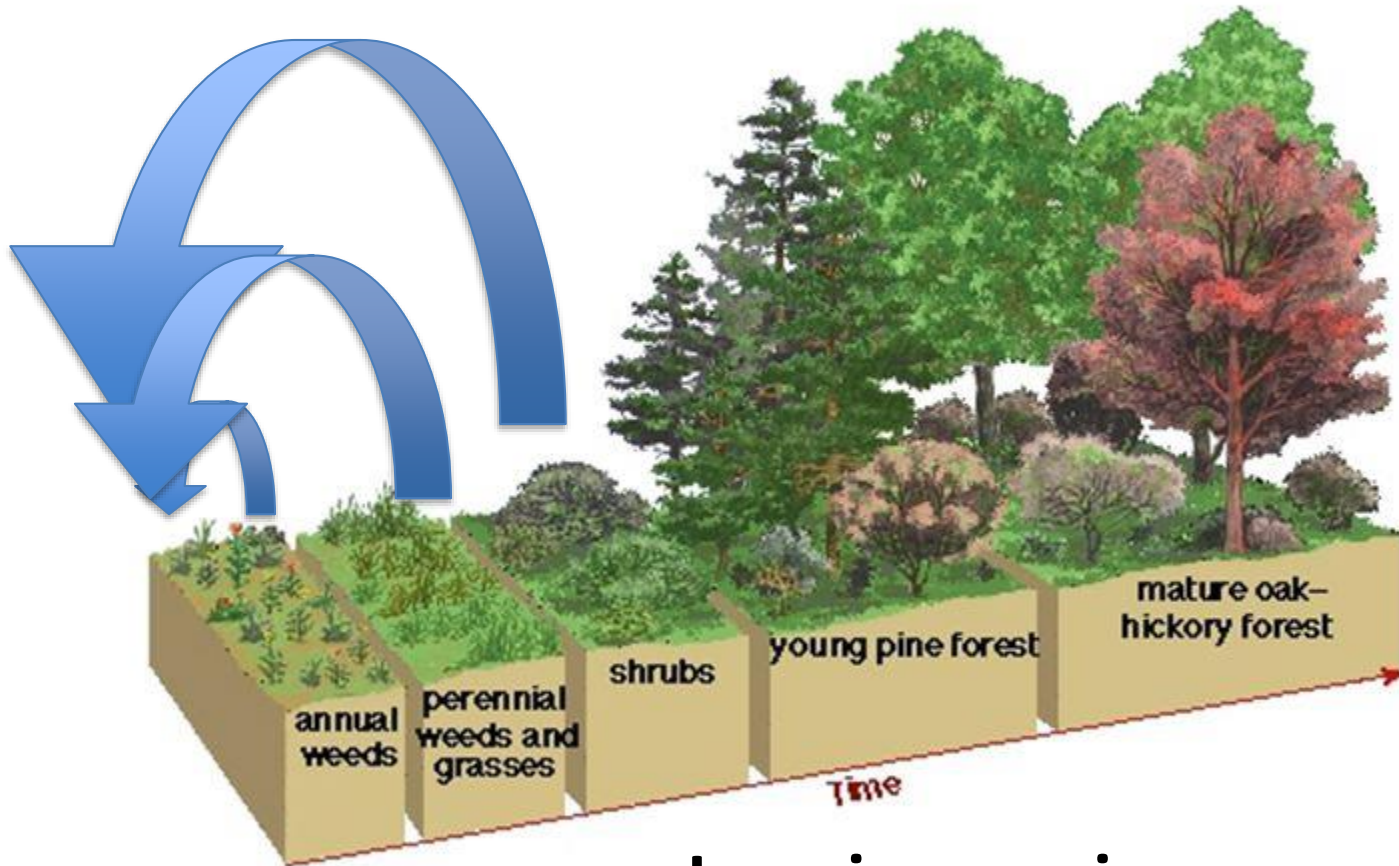
# Weed definitions by enthusiastic amateurs

- “A plant whose virtues have not yet been discovered”  
Ralph Waldo Emerson (1912)
- “*Weeds have always been condemned without a fair trail*” King (1951)

# Weed definitions by ecologically minded

- *“Weeds are pioneers of secondary succession, of which the weedy arable field is a special case”* Bunting (1960)
- *“Opportunistic species that follow human disturbance of the habitat”* Pritchard (1960)

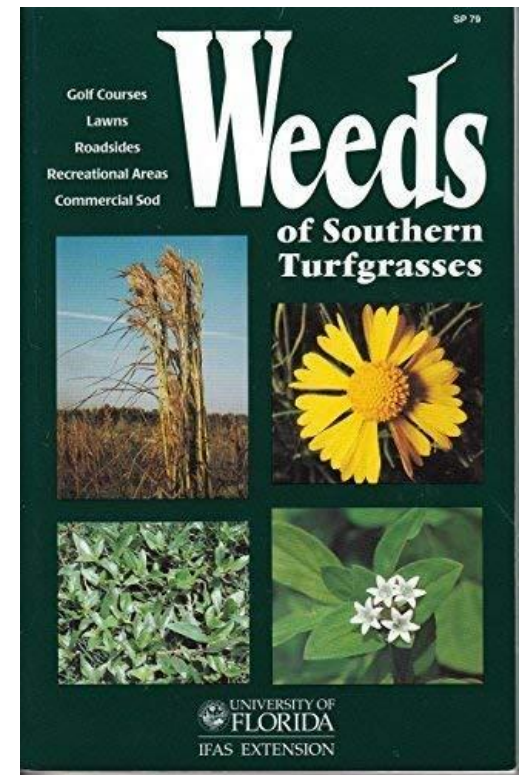
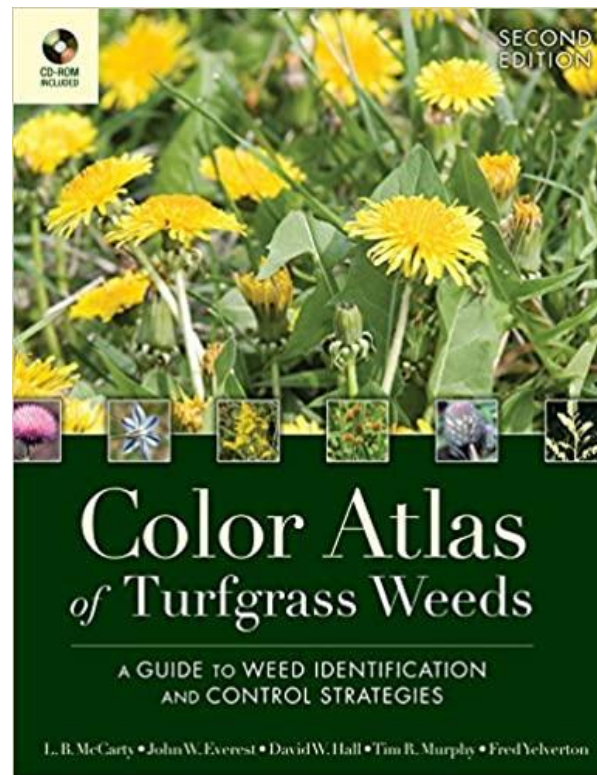
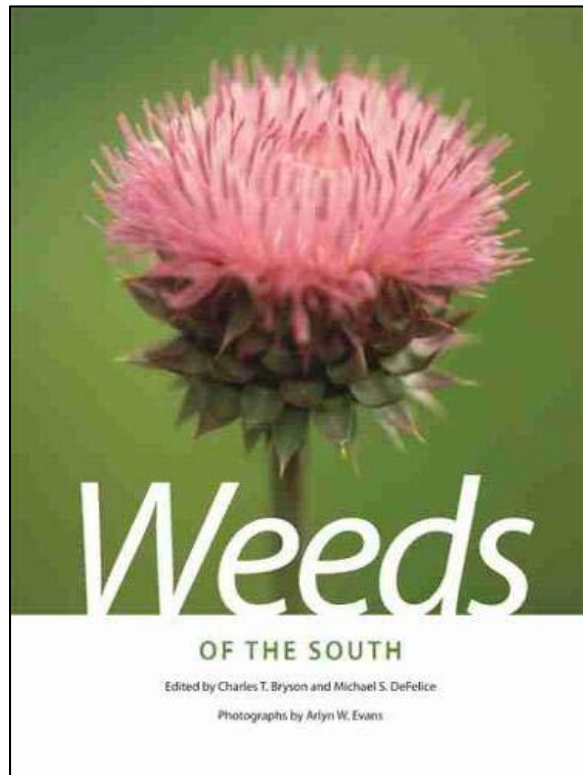
# Secondary succession



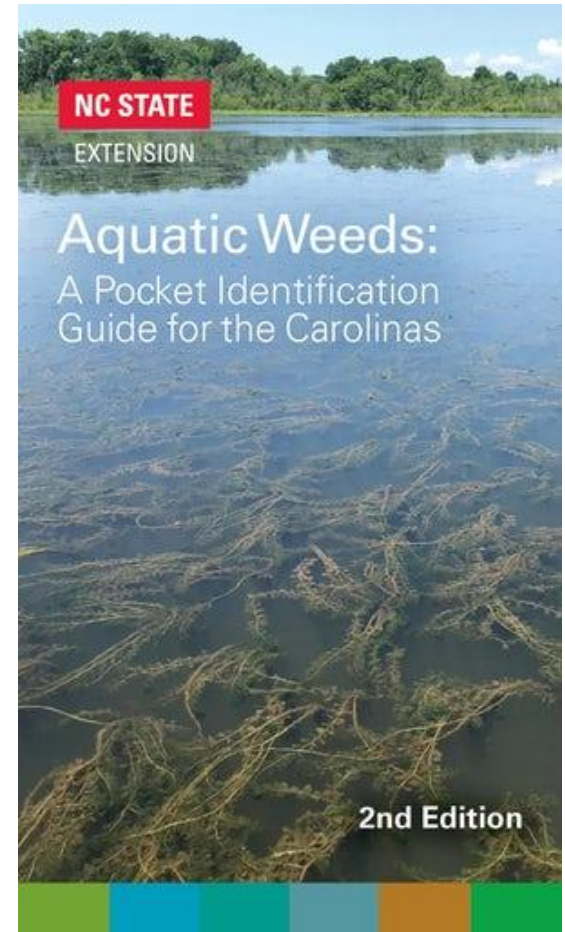
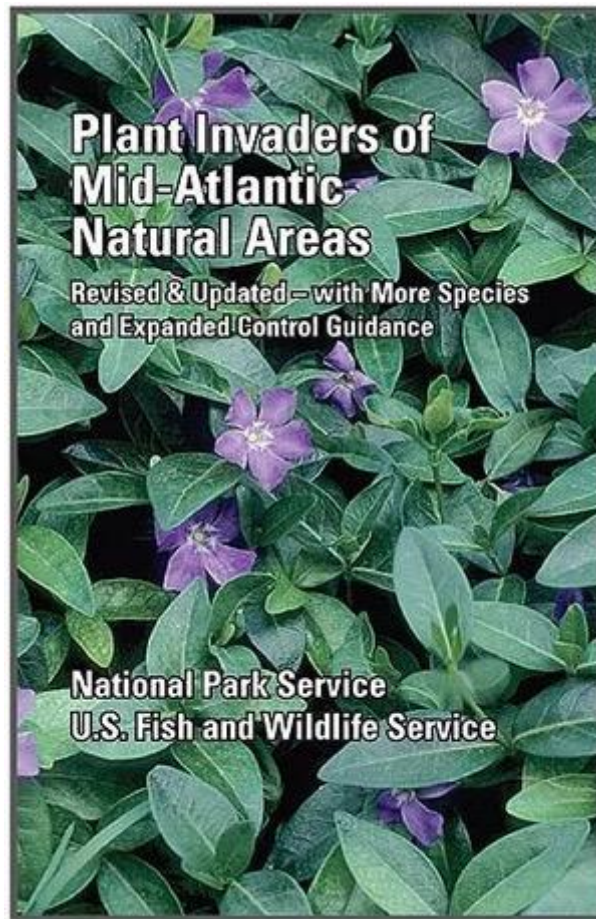
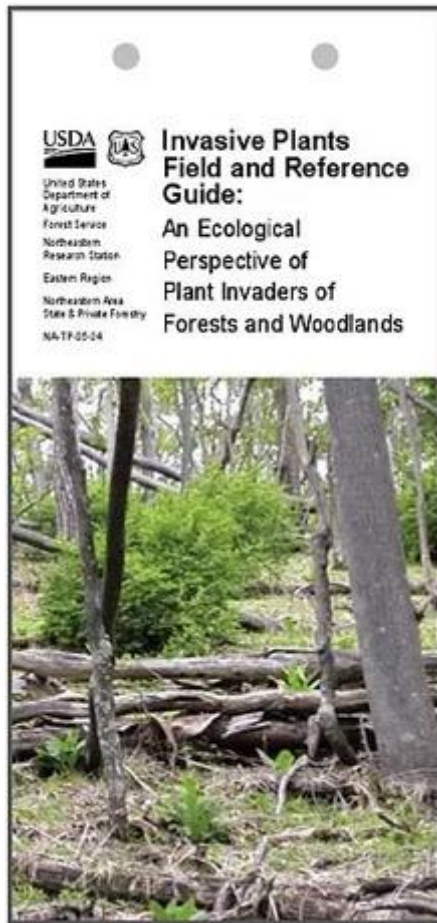
**Weeds**

**Invasive species**

# References



# References



**Leaves:** Simple and alternate; broadly ovate, 8-15 cm long, 5-12 cm wide (3 $\frac{1}{8}$ -6 in x 2-4 $\frac{3}{4}$  in), with abruptly pointed tip, truncate base;<sup>8,6</sup> stipule (ocrea), a tubular, membranous sheath.<sup>6,3</sup>

#### JAPANESE KNOTWEED

[*Fallopia japonica* (Houtt.) Ronse Decraene;  
*Polygonum cuspidatum* Sieb. & Zucc.; *Reynoutria*  
*japonica* Houtt.]  
POCU6

**Habit:** Perennial, herbaceous shrub 3 m (10 ft) or taller;<sup>8,20,23,7</sup> shoots survive one season; rhizomes survive decades; circular clonal stands formed in native habitat, senescing centrally.<sup>1</sup>

**Reproduction:** Primarily vegetatively via rhizome or shoot fragments;<sup>4,19,7,1</sup> by seed;<sup>8,20,6,7</sup> dioecious;<sup>8,6</sup> or gynodioecious;<sup>3,2</sup> viable, fertile hybrid (*F. x bohemica*) result of cross with *F. sachalinensis* (also non-native and invasive).<sup>11,3</sup>

**Leaves:** Simple and alternate; broadly ovate, 8-15 cm long, 5-12 cm wide (3 $\frac{1}{8}$ -6 in x 2-4 $\frac{3}{4}$  in), with abruptly pointed tip, truncate base;<sup>8,6</sup> stipule (ocrea), a tubular, membranous sheath.<sup>6,3</sup>

**Stems:** Round, sometimes ridged,<sup>8</sup> glaucous, often mottled;<sup>6</sup> hollow internodes<sup>7</sup> with swollen nodes.<sup>20,6</sup>

**Flowers:** Mid-late summer, small (2-3 mm or  $\frac{1}{8}$  in),<sup>1</sup> greenish-white;<sup>20,6,6</sup> 1,000s/plant;<sup>7</sup> narrow inflorescences at middle/upper nodes;<sup>20,6,6</sup> fly and bee pollinated; copious nectar,<sup>1</sup> from which bees produce a dark, quality honey.<sup>2,17</sup>

**Fruits/Seeds:** Fruits 3-winged, 8-9 mm or  $\frac{1}{4}$ - $\frac{3}{8}$  in; seeds (3-4 mm or  $\frac{1}{8}$  in) dark, glossy;<sup>8,20,6</sup> germination rate 61-95% in light and room temperature; no apparent cold stratification requirement;<sup>7</sup> wind,<sup>11</sup> possibly water dispersed (like rhizome and shoot fragments); at least one bird species eats the seeds.<sup>3</sup>

**Habitat:** Native to Asia; introduced to the U.S. in the mid-late 1800s;<sup>7</sup> disturbed and riparian areas, roadsides, woodlands; shade intolerant;<sup>1</sup> native substrate volcanic<sup>14</sup> with low pH; grows in a variety of pH levels and soil types; preference for wet habitats;<sup>1</sup> seedling survival dependent on water; adults tolerate drier conditions;<sup>11</sup> USDA hardiness zones 4-8.<sup>1</sup>

**Comments:** Tetraploid, hexaploid, or octoploid;<sup>11</sup> polyploidy may increase genetic diversity;<sup>10</sup> translocates N to radial clones until clones take up own N;<sup>1</sup> most N in roots if N is limiting;<sup>9</sup> C remobilized to rhizomes prior to shoot senescence;<sup>18</sup> treatment for skin disorders, hepatitis, inflammations, natural estrogen substitute;<sup>15</sup> exudes large quantity of guttation fluid;<sup>16</sup> grazed by sheep, cattle, horses; *F. japonica* var. *compactum* also escapes.<sup>1</sup>

**Similar Native Species:** Virginia knotweed (*P. virginianum*); not a shrub; ocreae with bristles; inflorescence a slender spike.<sup>8,20</sup>

#### JAPANESE KNOTWEED

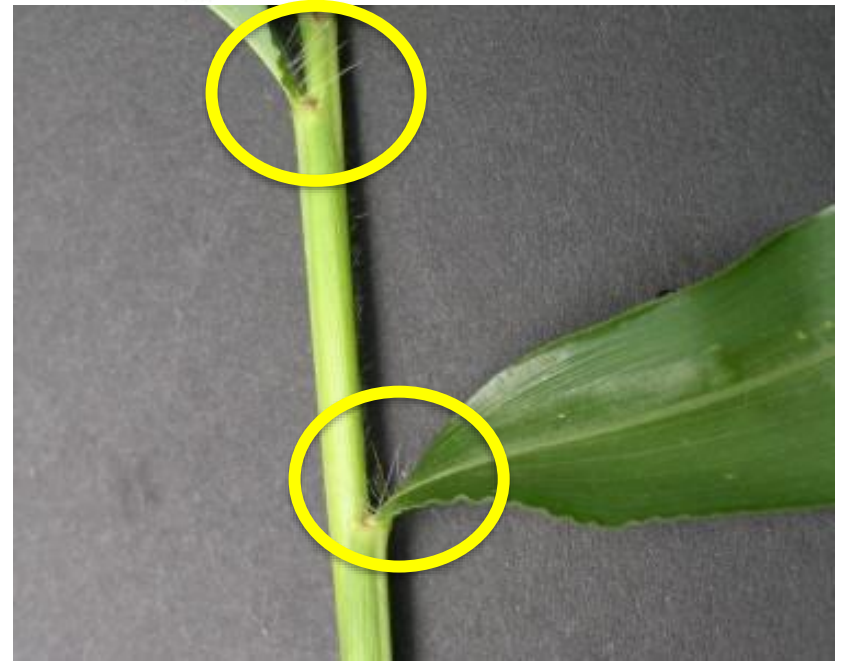


*Fallopia japonica* (Houtt.) Ronse Decraene

**Leaves:** Mid-vein of leaf blade offset from center; a line of silvery hairs runs down the mid-vein on upper surface; lanceolate, tapering at both ends, 5-10 mm ( $\frac{1}{4}$ - $\frac{3}{8}$  in) wide, 3-8 cm ( $1\frac{1}{8}$ - $3\frac{3}{16}$  in) long; pale green; leaf sheath collars with ciliate hairs.<sup>16, 8, 14</sup>

**Stems:** Reclining and branching; nodes glabrous and slightly swollen.<sup>6, 8, 14</sup>

**Flowers:** Late summer/early fall; terminal spike-like, branching inflorescence up to 7 cm ( $2\frac{3}{4}$  in) long with paired, hairy spikelets; in one variety, one spikelet is awned; another variety both are awnless;<sup>5</sup> may have both cleistogamous and chasmogamous



# Online resources

<https://wssa.net/wssa/weed/>

<https://plants.usda.gov/home>

<https://ncbg.unc.edu/research/unc-herbarium/floras/>

[https://www.aphis.usda.gov/aphis/ourfocus/planthealth/plant-pest-and-disease-programs/pests-and-diseases/SA\\_Weeds/SA\\_Noxious\\_Weeds\\_Program](https://www.aphis.usda.gov/aphis/ourfocus/planthealth/plant-pest-and-disease-programs/pests-and-diseases/SA_Weeds/SA_Noxious_Weeds_Program)